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May 6, 1841.

Sir JOHN W. LUBBOCK, Bart., V.P. and Treas., in the Chair.

The Right Honourable George Stevens Byng, M.P., was balloted for and duly elected into the Society.

The following papers were read, viz.—

1. "Investigation of a New and Simple Series, by which the Ratio of the Diameter of a Circle to its Circumference may easily be computed to any required degree of accuracy." By William Rutherford, Esq., of the Royal Military Academy, Woolwich. Communicated by Samuel Hunter Christie, Esq., M.A., Sec. R.S.

Among various formulæ for the rectification of the circle discovered by the author, he has found the one given in this paper to be that best fitted for computation: and he has been enabled by means of it, with comparatively little labour, to extend the number, expressing the ratio of the diameter to the circumference, to 208 places of decimals, a degree of accuracy hitherto unattainable, without a great amount of labour, by means of any of the series which have yet been employed.

The celebrated series of Mr. John Machin, for the rectification of the circle, is derived from the formula

$$\frac{\pi}{4} = 4\tan^{-1}\frac{1}{5} - \tan^{-1}\frac{1}{239},$$

which converges with considerable rapidity, but gives rise to tedious computations, in consequence of the divisor 239 being a prime number. But by converting the above formula into the following,

$$\frac{\pi}{4} = 4\tan^{-1}\frac{1}{5} - \tan^{-1}\frac{1}{70} + \tan\frac{1}{99},$$

a series is obtained by which the extended computation above mentioned was readily effected.

The methods of computation are then stated in detail, and the resulting value of π is given to 208 places of decimals, which is presumed to be accurate to the last figure, the computations having been actually carried as far as 210 figures.

2. "On the Phenomena of thin plates of Solid and Fluid Substances exposed to polarised light." By Sir David Brewster, K.H., D.C.L., F.R.S., & V.P.R.S. Ed.

From a theoretical investigation of the phenomena described in this paper, the author deduces the important law, that when two polarized pencils, reflected from the surface of a thin plate, lying on a reflecting surface of a different refractive power, interfere, half an undulation is not lost, and white-centred rings are produced. When the inclination is exactly 90°, the pencils do not interfere, and no rings are produced.